

## LECTURE: 2

# ETD 801S: Science, Technology & The Development Process

### ***Instructor:***

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**TIME: 7:30 – 10:30 AM**

**VENUE: LT 11**

# Presentation Outline

## ➤ First session

- Economic Theory and Technology Historical Perspectives
- Theories of the firm in technology and development
  - ❖ The behavioural theory of the firm
  - ❖ Evolutionary theory of the firm

## ➤ Second session

- ❖ Synergy

# Technology Historical Perspectives

■ **ADAM SMITH:** in his book titled, An Inquiry into the Nature and Causes of the Wealth of Nations (1776) indicates clearly that he wanted to analyze the nature of economic growth. **Smith attributes growth to the skill, quickness and judgment with which its labour is generally applied.** The major themes are **economic growth, value and distribution, the working of markets, intern trade and the relationship** between the state and the individual.

■ Although Adam Smith wrote within the context of a primarily agrarian society, he was profoundly aware of the importance of **machinery**.

# Technology Historical Perspectives

## ■ ADAM SMITH cont'

■ Smith saw the development machinery as the consequence of the social division of labour in the factory, thus implicitly taking issue with latter-day technological determinists who examine the effects on economic and society of autonomous as in technology, including machinery.

■ Smith states clearly that “the invention of all those machines by which labour is so much facilitated and abridged seems to have been originally owing to the division of labour.

# Technology Historical Perspectives

- **DAVID RICARDO:** Ricardo assumed that **all accumulation was derived from profit**, the question of the distribution of the national product between profit, rent and wages, assumed a central significance using international trade and technical change.
- For Ricardo, technical change embodied in machinery would increase the rate of accumulation by reducing the cost of wage goods. “if ... by the extension of foreign trade or by improvement of machinery, the food and necessaries of the labour can be brought to the market at reduced prices, profit will rise”.

# Technology Historical Perspectives

- **KARL MARX:** Marx was concerned with **productivity, its causes and consequences** and the **contributions made by the development of machinery**. For Marx, the **machine producing sector** lay at the heart of the dynamic process of accumulation. Beginning where Smith left off, Marx agreed that the division of labour in manufacture gave rise to the emergence of a specialized machine-producing sector.
- However, going beyond Smith, Marx argued that the production of **machinery led to the undermining (handicraft) of the manufacturing firm of production** itself.

# Technology Historical Perspectives

■ **KARL MARX:** By applying science in the design and production of machinery, productivity may be increased and hence costs reduced. Like every other instrument for increasing the productivity of labour machinery is intended to cheapen it is the **relative price** labour power and machinery that will govern the **introduction** of machinery since it is this that will determine actual costs and hence influence the actions of capitalists under the pressure of competition. Production techniques will be expected to differ between countries which different relative prices. The argument that the introduction of machinery depended on relative factor prices.

# Foundation of Evolutionary Economics

- Veblen sees the evolutionary metaphor as crucial to the understanding of the process of technological development in the capitalist economy. Biological evolutionary is based on three essential features.
- First, there must be sustained vaccination **among the members of a species in population.**
- Second, there must be some **principle of heredity** or continuity through which offspring's have to resemble their other members of their species.
- Third, **natural selection** itself operate either because better-adopted organism leave increased numbers of offspring.



# Theories of the firm in technology and development

## ■ Characteristics of technology

■ Defining technology as a package of technical information useful in the production of a given good or service, the following peculiarities have been:

■ Firstly, in as much as it has some of the properties of the so called “public good” technical information is indeed a very special factor of production.

■ Secondly, rather than being exogenously given and freely and instantaneously accessible to everybody, new technical knowledge and information had to be systematically sought for by manufacturing firms.

# Theories of the firm in technology and development cont'

## ■ Characteristics of technology cont'

■ Thirdly, a package of technical information is almost never:

- Completely specified
- Perfectly understood
- Easily replicable (inimitability)

■ Rather, as Nelson (1979) has pointed out there is a large element of tacitness, inimitability and imperfect understanding, underlying the notion of technical knowledge.

# Technology and market Mechanism

- *The production technique* is the package of technical information, indicating how to perform a given economic activity, that is, the production of a good or service. Such package of technical information will normally consist of:
- The design and engineering of the product (or service) in question.
- A production process or basic manufacturing routine and
- An industrial organization arrangement (degree of vertical integration, patterns of sub-contracting etc.)

# Technology and market Mechanism

■ *Technical change* is a change in the package of technical information employed by a given firm and that such change could be related to any one of such of the 3 previous characterized areas: that is it can involves a change in the product design, in the production process and /or in the industrial organization routine followed by the plant.

# What makes technical information a factor of production

- *Technical information is a public good*
- *Information and appropriability:* returns through patent rights, secrecy, etc.,
- *Increasing returns to the use and production of technical information:* the unit cost of technical information generated decreases as the scale of output increases.
- *The common pool property:* others come on board with different things.

# Standard Microeconomic theory

■ Standard microeconomic theory focuses on how economic decisions are coordinated by the market mechanism. It shows how coordination between quantities demanded by buyers and quantities supplied by sellers is achieved by the price mechanism. The standard microeconomic theory is based on 4 assumptions:

■ *Firms are holistic entities*

■ *Firms have a single objective*

■ *Everyone has perfect information*

■ *The behaviour of producers and consumers can be described as maximizing behaviour*

# [The behavioural theory of the firm]

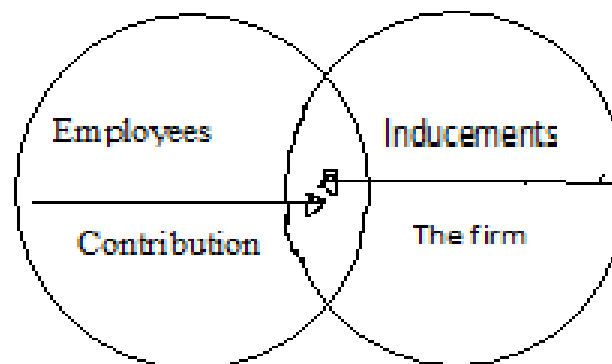
- The behavioural theory of the firm, postulates the firm as a coalition of (group of) participants each with their own objectives. Such a coalition of participants need not have maximization of profits as its sole objective.
- The process of defining the goals of the organization is:
  - First step in describing actual decision making processes within the firm.
  - The second step is to describe, how the organizations forms expectations upon which the decision process are based.
  - The third step is to describe the process of organizational choice.

# [The behavioural theory of the firm]

- The firm as a coalition of participants
- Participants in the firm are employees; investors, supplies, distributors, consumers and possibly others. .  
*The most important groups, however, within the framework of the behavioural theory are those most directly and actively concerned with the firm, namely the managers, workers and shareholders.*
- Contributions made by employees include not only the labour hours they put but also their ideas for improvement, the intelligence and so on. Inducement offered to employees include monetary payment but also non-monetary benefits.



# The behavioural theory of the firm



The relationship between the firm and its employees in behavioural theory

# Organisational goals

## ■ Bargaining and organisational slack

■ In behavioural theory, it is postulated that goals of the firm are arrived at through a bargaining process. During this bargaining process both the composition and the general goals of the coalition are established. The bargaining power of each potential participant depends on how unique the contribution of is that he can offer to the coalition.

■ Their difference between total resources and total payment necessary to preserve the coalition is termed the organizational slack.

# Organisational goals cont'

## ■ Operational sub-goals

■ In the behavioural theory we assume that organizational sub goals are specified and given to functional departments. The goals of the firm are set ultimately by the top management. There are five main goals of the firm:

■ Production goal

■ Inventory goal

■ Sales goal

■ Share of the market goal

■ Means for the resolution of the conflict

## Organisational goals cont'

- Another responsibility of the top management is to resolve the conflict in the firm and the most important means for the resolution are:

- *Monetary payments*

- *Side payment (which takes the form of policy commitment)* — research incentives

- *Slack payment:* excess payments

- *The sequential attention to the demands of the individual members or groups*

- *Decentralization of decision making (delegating authority for action within a given limit)*

# Evolutionary theory of the firm

- The evolutionary theory is concerned with what happens within organizations and interactions between organizations and their environment, which include other organizations. One explanation can be traced to Larmack another to Darwin.
- **Larmack:** explanation is based on two principles.
- *The inheritance of acquired characteristics:* Characteristics acquired by individuals can be inherited by future generations.
- *The principle of use and disuse:* states that, those parts of an organisms body that are used grow larger. Those parts that are not use tend to wither away.

# Evolutionary theory of the firm cont'

- **Darwin**
- The Darwinian explanation on the other hand emphasizes the role of cumulative natural selection. Individual (chance) variations and natural selections is as a result of environmental conditions and retention (in the gene pool) of the adaptive characteristics due from the causal chain.

# Evolutionary theory of the firm

- *Why do giraffes have long necks*

- This question allows us to separate evolutionary and creationist arguments and within the evolutionary strand, Darwinist and Lamarckian arguments. Creationists' argument involves deliberate design. Giraffes were designed the long necks. These characteristics allows them to survive among other species. Evolutionary argument on the other hand emphasizes cumulative adaptation. Giraffes were not designed with long necks, but gradually acquired them.

# The genesis of modern evolutionary theories of the firm

- So many years ago, Alfred Marshall turned to **biology for inspiration** in his principles of economics and Thorstein Veblen suggested that the metaphor of Darwinian Evolution could be applied to economics.
- It largely emanates from a famous controversy about the legitimacy of the assumption of profit maximization in economics.
- Opposing the assumption, economists such as Richard Lester and Robert Gordon **argued that profit maximizing behaviour was neither typical nor feasible in real world.**



# The genesis of modern evolutionary theories of the firm

- In contrast, the neoclassical economist Fritz Machlup suggested that even if they were not fully conscious of them, business managers use complex, optimizing calculations just as we try to choose the optimum speed and position when trying to overtake another vehicle with a car.
- This debate of profit maximization has continued to this day, Alchian argues that Lester and Gordon were both wrong. Alchian contended that, it did not matter whether firms were trying to maximize or not market competition created an environment akin to natural selection where the more efficient would win out.

# The genesis of modern evolutionary theories of the firm

- Selective success, Alchian argues, depends on behaviour and results not motivations.
- In response to Friedman a, Sidney winter, wrote an extensive critique of Friedman's natural selection defense of profit maximization.
- Winter pointed out that, Friedman natural selection argument was imperfectly specified in that, and it did not show how maximizing behaviour was replicated through time.

# The genesis of modern evolutionary theories of the firm

- Winter suggested that **routines** in the firm have a relatively durable quality through time.
- They may **help to retain skills and other forms of knowledge**, and to some extent they have the capacity to **replicate through mutation, personal mobility, take-overs**.
- Further, routines can change through managerial or other actions when the firm's profits are below satisfactory level. Hence winter's work is a partial answer to Penrose as well as a direct attack on Friedman.

# The Nelson-Winter Approach to evolutionary theory of the firm

- Their primary concept to denote organizational functioning is **Routines**.
- Routines refer to all regular and predictable behaviour patterns of the firm. There are production routines as well as strategic routines. We consider two aspects of routines.
- *Routines serve as organizational memory.* Memories are further endangered when there is individual turnover. Turnover is one cause of mutations in routines.
- *Routines also serve as an organizational treaty.* Satisfying takes the place of maximizing and the existence of organizational conflict is not assumed away. It may be seen as a stabilizing force in organization.

# SYNERGY TIME

- Any problem should be brought forward for discussion.
- Suggestions are welcome
- Wise saying & inspirational words

**LETS ENJOY OUR STAY**

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**THANK YOU**